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Nitrogen fertilizer management options

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Abstract
Carefully weigh the optimum timing and placement of each pound of N used this year. All N fertilizers are effective for supplying crop N needs when properly managed. On soils with large potential for N loss (leaching or denitrification), application close to crop uptake is important to minimize losses. Avoid early applications, especially for products containing the nitrate form of N. Be mindful of the unique properties and management needs of each material. Don't get in a rush and waste valuable N just to get the job done.

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Anhydrous ammonia

- Anhydrous ammonia must be injected into the soil and can be applied from preplant to sidedress.
- Free ammonia may be toxic to seedlings, therefore proper placement (depth and location relative to the corn row) is important with preplant applications. Consider applying at an angle to the row so entire rows or sets of rows are not placed near an ammonia band. Waiting several days between injection and planting can lower ammonia damage risk. Lower N rates and narrower knife spacing result in lower N concentration per band.
- Sidedressing ammonia can begin immediately after planting, and injecting between either every row or every other row works. Waiting until after the sampling period for the late spring soil nitrate test (LSNT) allows for rate adjustments based on LSNT results. This could be helpful if N supply is short, and is a good strategy for fields with manure history.

Urea

- Urea rapidly converts to ammonium (with concurrent pH increase) in the presence of moisture and urease enzyme (found in soil and plant residue). Therefore, when banded or broadcast on the soil surface free ammonia can form. When banded, ammonia can lead to root and seedling damage. On the soil surface, free ammonia is lost to the atmosphere (volatilization). Conditions that lead to greater volatilization include warm weather, moist and drying soils, high residue, high soil pH, no rainfall after application, low soil exchange capacity, and high application rate. Losses have been measured up to 30 percent. Rainfall of 0.25-0.5 inch or tillage incorporation within 2-3 days after application minimizes losses. Urea should not be placed with the seed at planting. Urea rates in starter (2 inch by 2 inch) should be limited to avoid ammonia damage. Urea can be band-injected preplant or sidedress. Preplant bands should be placed away from corn seedlings. If rescue or late sidedress applications are made, urea can be applied with broadcast equipment or flown on. Some urea granules may lodge in corn whorls,

but typically cause only minor leaf damage. Urea should not be applied to frozen/snow-covered ground in the winter.
- Urea-ammonium nitrate solutions (UAN 28 or 32 percent N)
- These materials are comprised of approximately one-half urea and one-half ammonium nitrate and are subject to volatilization. Because only one-half of the N is urea, loss potential is lower than with straight urea. Therefore, UAN solutions should be either incorporated or injected into soil for greatest efficiency and reliability, especially in no-till and high-residue systems. Surface dribble banding reduces volatilization. Surface applications can work, but requires low soil temperatures or rainfall within 2 to 3 days to limit volatility. If soils are dry and no rain occurs, surface-applied N may be unavailable to plants.
- Solution UAN application timing is flexible. It can be applied preplant, at planting, or sidedress. Applications should not be made to frozen/snow-covered ground. Solution UAN can be broadcast postemergence, but because of foliar plant burning should occur before corn reaches the V7 growth stage (no more than 90 lb N/acre for corn smaller than stage V3, or 60 lb N/acre if corn is between stages V3-V7). Check herbicide labels for possible restrictions. In-season applications after that stage should be injected or dribble applied, and can be between every other row.

Other N fertilizers

- Other fertilizer N products, such as ammonium nitrate and ammonium sulfate, have limited volatile loss potential and are good candidates for surface application. They also can be banded into the soil, or broadcast and incorporated. Because ammonium nitrate is half ammonium and half nitrate, it is more subject to immediate N loss by leaching or dentrification. It should therefore not be applied a considerable time before planting.
- Many mixed fertilizers contain N. Two products with large use as phosphorus sources are diammonium phosphate (DAP) and monoammonium phosphate (MAP). The N in these products does not volatilize and should be accounted for when figuring the total N application.

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